WHAT IS CLAIMED IS:

1. A plasma processing method for processing a processing object with a plasma, the method including: in a state that a plate-shaped insulator is disposed adjacent to a plate-shaped electrode disposable opposite to the processing object under a pressure around atmospheric pressure, supplying a discharge gas containing an inert gas to a vicinity of the processing object from one gas exhaust port located nearer from the plate-shaped electrode, out of at least two-line gas exhaust ports which are disposed around the plate-shaped electrode and which are formed so as to be surrounded by the plate-shaped insulator and moreover which are different in distance to the plate-shaped electrode from each other, while supplying a discharge control gas from the other gas exhaust port to the vicinity of the processing object; and, simultaneously with the supply of the gases, supplying electric power to the plate-shaped electrode or the processing object.

2. The plasma processing method according to Claim 1, wherein the discharge control gas supplied from the gas exhaust port farther from the plate-shaped electrode out of the at least two-line gas exhaust ports contains a gas having a discharge-starting voltage larger than that of the inert gas.

3. The plasma processing method according to Claim 1,

wherein in a state where a line-direction opening length of the gas exhaust port for the discharge gas located nearer from the plate-shaped electrode is smaller than a line-direction opening length of the gas exhaust port for the discharge control gas located farther from the plate-shaped electrode, the plasma processing of the processing object allows to be carried out while the discharge control gas exhausted from the gas exhaust port for the discharge control gas is maintained present around the discharge gas exhausted from the gas exhaust port for the discharge gas.

4. The plasma processing method according to Claim 1, wherein the inert gas is any one of He, Ar, Ne, and Xe.

5. The plasma processing method according to Claim 1, wherein the discharge control gas larger in discharge-starting voltage than the inert gas is a halogen-containing gas such as SF_6, CF_4, or other CxFy (where x and y are natural numbers), NF_3, O_2, Cl_2, and HBr, as a reactive, etching gas.

6. The plasma processing method according to Claim 1, wherein the discharge control gas larger in discharge-starting voltage than the inert gas is a gas having a He concentration of less than 50%.

7. The plasma processing method according to Claim 1, wherein the processing object is processed with the plasma in a state where the discharge control gas larger in

discharge-starting voltage than the inert gas is a gas having a property of suppressing electric discharge in a vicinity of the gas exhaust port located farther from the plate-shaped electrode.

8. The plasma processing method according to Claim 1, wherein the processing object is processed with the plasma in a state where the discharge control gas larger in discharge-starting voltage than the inert gas is a gas having a property that a width of linear discharge becomes narrower, compared with a case where a flow of the gas is not provided.

9. The plasma processing method according to Claim 1, wherein the processing object is processed with the plasma in a state where a part of a surface of the plate-shaped insulator confronting the processing object has a taper portion.

10. The plasma processing method according to Claim 1, wherein the processing object is processed with the plasma in a state where a distance between the processing object and the gas exhaust port for the discharge control gas located farther from the plate-shaped electrode is smaller than a distance between the processing object and the gas exhaust port for the discharge gas located nearer from the plate-shaped electrode.

11. The plasma processing method according to Claim

10, wherein assuming that a distance between the processing object and the gas exhaust port for the discharge control gas located farther from the plate-shaped electrode is m and that a distance between the processing object and the gas exhaust port for the discharge gas located nearer from the plate-shaped electrode is k, then it holds that

$0 \text{ mm} < k-m \leq 1 \text{ mm}$.

12. A plasma processing apparatus comprising:

a plate-shaped electrode;

a plate-shaped insulator placed at a position where the plate-shaped insulator is adjacent to the plate-shaped electrode and where the plate-shaped insulator does not cover a part of a surface of the plate-shaped electrode confronting a processing object;

an electric power supply unit for supplying electric power to the plate-shaped electrode or the processing object;

a discharge-gas supply unit for supplying a discharge gas containing an inert gas to one gas exhaust port located nearer from the plate-shaped electrode, out of at least two-line gas exhaust ports which are disposed near the plate-shaped electrode and which are different in distance to the plate-shaped electrode from each other; and

a discharge-control gas supply unit for supplying a discharge control gas, which is larger in discharge-

starting voltage than the inert gas, to one gas exhaust port located farther from the plate-shaped electrode, out of the at least two-line gas exhaust ports which are disposed near the plate-shaped electrode and which are different in distance to the plate-shaped electrode from each other.

13. The plasma processing apparatus according to Claim 12, wherein at least a surface of the plate-shaped electrode confronting the processing object has a taper portion.

14. The plasma processing apparatus according to Claim 12, wherein a line-direction opening length of the gas exhaust port for the discharge gas located nearer from the plate-shaped electrode is smaller than a line-direction opening length of the gas exhaust port for the discharge control gas located farther from the plate-shaped electrode.

15. The plasma processing apparatus according to Claim 12, wherein a part of a surface of the plate-shaped insulator confronting the processing object has a taper portion.

16. The plasma processing apparatus according to Claim 12, wherein a distance between the processing object and the gas exhaust port for the discharge control gas located farther from the plate-shaped electrode is smaller than a distance between the processing object and the gas

exhaust port for the discharge gas located nearer from the plate-shaped electrode.

17. The plasma processing apparatus according to Claim 16, wherein assuming that the distance between the processing object and the gas exhaust port for the discharge control gas located farther from the plate-shaped electrode is m and that the distance between the processing object and the gas exhaust port for the discharge gas located nearer from the plate-shaped electrode is k, then it holds that

$$0 \text{ mm} < k-m \leq 1 \text{ mm}.$$